PAVEMENT SURFACE ANALYSIS LABORATORY FACT SHEET

Research that is Essential, Indispensable, and Connected to our Customers.

PURPOSE

The Pavement Surface Analysis Laboratory aids in the development of new, non-contact hardware and analysis techniques to quickly identify and quantify surface profile and texture parameters with minimal or no disruption to the highway user. From these traces/measurements, numerous pavement performance inferences can be derived concerning ride quality (roughness, smoothness, noise), safety (friction and geometry), and durability (roughness, deformation, and aggregate segregation).

DESCRIPTION

The Pavement Surface Analysis Laboratory has developed prototype systems that are being evaluated and demonstrated in field trials. Research oriented versions of standard performance measurement systems have also been developed and utilized to expand understanding and potential areas of application. The Road Surface Analyzer (ROSAN) refers to a series of non-contact pavement surface texture measurement devices and the Profile and Rut measurement device (PRORUT) is a non-contact vehicle based system to measure the longitudinal profile and rutting of the roadways at highway speeds. The PRORUT vehicle has been used as the base for a number of other measurement systems. In addition to PRORUT, the Pavement Surface Analysis Laboratory uses a step van, a larger, general purpose research vehicle configured for ROSAN prototypes, and a texture van, a general purpose research vehicle equipped to support portable sensor systems to measure pavement surface characteristics.

SPECIAL CAPABILITIES

- First lab at Turner-Fairbank Highway Research Center (TFHRC) to enter into a Cooperative Research and Development Agreement with a private partner to advance technology beyond prototype stage.
- Technology supports ONE-DOT in that the equipment can be used on airport runway pavements as well as highway pavements.
- Has responded to many requests from research organizations (National Cooperative Highway Research Program (NCHRP), World Road Congress (PIARC), State DOTs, Universities, and the Federal Highway Administration (FHWA)) for use of its equipment in research studies involving pavement surfaces.
- Focuses on high-speed, non-contact, vehicle-independent, affordable, and portable devices (ROSAN systems).
- Has consistently produced accurate, user-friendly, and affordable technology with modest resources.

PRODUCTS AND SERVICES

- Developed, validated, and demonstrated several versions of the ROSAN system for measuring texture, aggregate segregation, grooves, tining, joints, and faulting. ROSAN systems have been used in a number of NCHRP and FHWA sponsored studies.
- Developed, validated, and demonstrated prototype ROSANvm (vehicle equipped with a transverse beam capable of measuring profile and texture over a 4267-mm by 102-mm [168-in by 4-in] area).
- Working with an FHWA divisional office, and a State DOT, aided in the development and demonstration of a prototype ROSAN cross-slope measurement device.
- Designed and built PRORUT, a research oriented non-contact road profiling device. This vehicle has been used in a number of sponsored studies for NCHRP, PIARC, and FHWA. PRORUT was recently used in a project to measure Portland Cement Concrete (PCC) pavement "Warp and Curl."
- Studies technical information, computer software, analysis procedures, and data collection systems for pavement surface analysis. This information, and the devices available, enable the analysis of network-wide and project-level friction, roughness, texture, smoothness, inside and outside vehicle noise, aggregate segregation, and rutting.

LAB PARTNERS

The Pavement Surface Analysis Laboratory has active partnerships with FHWA Core Business Units and Service Business Units, State DOTs, and small businesses.

- Aided in the development of a cross-slope measurement device with South Carolina DOT.
- Performed research at Wallops Island (NASA) to evaluate the effectiveness and applicability of non-contact surface texture data collection devices.

The Turner-Fairbank Highway Research Center (TFHRC) has more than 24 laboratories for research in the following areas: safety operations, including intelligent transportation systems; materials technology; pavements; structures; and human centered systems. The expertise of TFHRC scientists and engineers covers more than 20 transportation-related disciplines, these laboratories are a vital resource for advancing this body of knowledge created and nurtured by our researchers. The Federal Highway Administration's Research, Development, and Technology Service Business Unit operates and manages TFHRC to conduct innovative research to provide solutions to transportation problems both nationwide and internationally. TFHRC is located in McLean, VA. Information on TFHRC is available on the Web at ***www.tfhrc.gov****.*

FHWA-RD-01-099

This RD&T fact sheet provides concise information about a TFHRC facility.

- Developing a ROSAN system for Federal Lands Highway Division implementation.
- Collaborating to evaluate the effect of pavement texture on friction and to correlate surface texture data with accident rates for Virginia DOT.
- Providing technical support of Small Business Innovative Research program (SBIR) projects developing a new generation of lasers to support future non-contact pavement condition assessment tools.

CURRENT PROJECTS

The Pavement Surface Analysis Laboratory is involved in a number of studies, as well as providing assistance to other researchers:

- Resolving issues regarding correlation of Mean Profile Depth and Mean Texture Depth and the quantifying deviation in texture measurements due to travel path variations.
- Tire/pavement (texture) noise generation reduction.
- Texture/friction relationship.
- Profile based "Warp and Curl" and faulting measurement of PCC pavement.
- Aggregate segregation of Asphalt Concrete pavements (NCHRP study).

EXPERTISE

The lab combines the expertise of civil, mechanical, and electrical engineers with experience in pattern recognition, algorithm development, experimental design, analysis (engineering and statistical), system design, system control, and mechanical and electrical design; computer programmers with experience in windows-based GUI programs, data acquisition, and signal processing; and technicians with experience in electronics fabrication, mechanical fabrication, instrumentation, and vehicle modification.

STATISTICS

ROSANv

- Noise Study: at least two states have recently changed their tine specification for PCC pavement for noise reduction.
- Aggregate Segregation: based on an NCHRP study, American Association of State Highway and Transportation Officials (AASHTO) is considering setting a standard for measuring aggregate segregation using ROSANv.

PRORUT

- Used in a major NCHRP study to establish national guidelines and reference material on the operation of road profilers for measuring road roughness.

Warp & Curl

- Preliminary results of ongoing research are to be applied as soon as possible to participating States and expect wide spread application of research results as benefits are estimated to be in the tens of billions of dollars. ■